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TIRE MATERIAL VULCANIZING PRESS
[TAIYASOZAI KARYUYOPURESU]

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/1[1]

Specification

1. Title of the Invention

TIRE MATERIAL VULCANIZING PRESS

2. What is Claimed is:

(1) A tire material vulcanizing press, which is made from two parts, characterized in that said press is comprised of:

a lower mold chamber;

an upper mold chamber, which can move in the axial direction so as to engage in said lower mold chamber;

a long operational element, which can operate between the first position, wherein the upper end of said element is extended in the direction of the upper mold chamber, and the lower position, wherein said upper end is pulled into the lower mold chamber, and said element is installed in the center of the press so as to move from the upper position to the lower position when the upper mold chamber moves towards the lower mold chamber, and at the same time, said element is positioned within the lower mold chamber so as to reciprocally move in the axial direction;

a vulcanizing inner tube, which can be inserted into the tire material and expanded;

[1] Numbers in the margin display pagination in the foreign text.

a means for fixing the upper surface of said inner tube to the upper part of said element;

a ring-like sleeve, which is held in the lower mold chamber and concentric with said element;

a means for fixing the lower surface of said inner tube to the upper end of said sleeve; and

a device for loading said sleeve so that said sleeve reciprocally moves in the axial direction between the position, wherein said sleeve is extended in the upper direction, and the position, wherein said sleeve is pulled into the lower part of the lower mold chamber, while said movement of said sleeve is made independently from the axial movement of said element.

(2) A tire material vulcanizing press, which is made from two parts, characterized in that said press is comprised of:

a lower mold chamber;

an upper mold chamber, which can move in the axial direction so as to engage in said lower mold chamber;

a cylinder, which is installed in the center part inside the lower mold chamber;

a piston, which is installed inside the cylinder so as to move in the axial direction between the upper position and the lower position and can move from the upper position to the lower position when the upper mold chamber moves toward the lower mold chamber;

a vulcanizing inner tube, which can be inserted into the tire material and expanded;

a means for fixing the upper surface of said inner tube to the upper part of said piston;

a ring-like sleeve, which is held in the lower mold chamber and surrounds said cylinder;

a means for fixing the lower surface of said inner tube to the upper end of said sleeve; and

a device for loading said sleeve so that said sleeve reciprocally moves in the axial direction between the position, wherein said sleeve is extended in the upper direction, and the position, wherein said sleeve is pulled into the lower part of the lower mold chamber, and said movement of said sleeve is independent from the axial movement of said piston.

(3) The tire material vulcanizing press as set forth in claim 2, characterized in that said press is further comprised of a means for adjusting the relative axial movement distance of the piston and the sleeve so that said inner tube is expanded around the inner circumference of the tire material when the upper end of said sleeve and the upper end of said piston are released in a meaning (→ position?), which is the maximum distance in the axial direction, while the inner tube is completely pulled from the inner circumference of the tire material when the upper end of said sleeve and the upper end of said piston are released in

the other meaning (→ position?), which is the maximum distance in the axial direction.

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(4) The tire material vulcanizing press as set forth in claim 2, characterized in that the upper end of the cylinder has a cover for encompassing the first center hole, through which the piston passes, and the second hole, which is separated from said first center hole in the radial direction, and said press is further comprised of a first fluid supply means, which is fixed into the lower mold chamber and connected to the inside of the inner tube through the second hole.

(5) The tire material vulcanizing press as set forth in claim 4, characterized in that said press is further comprised of second and third fluid supply means, which are separately installed inside the lower mold chamber so as to selectively drive the sleeve and the piston.

3. Detailed Description of the Invention

The cylindrical mold chamber press, which is made from two parts, is generally used for vulcanizing tire materials. According to the equipment, which represents the above described type of press, the lower surface of the vulcanizing inner tube, which can be expanded inside the tire material, is fixed to the lower mold chamber while the upper surface of said tube is fixed to the piston capable of moving in the axial direction within

the cylinder, which is supported by the lower mold chamber. After the above described tube is inserted into the tire material and expanded, the upper mold chamber presses the piston into the cylinder. Therefore, both the lower and upper mold chambers are pressurized and approach each other in the axial direction thereby making the tire material into a desired shape. The vulcanizing operation is performed by applying appropriate heat to the inside of the expanded tube while the press is closed.

The equipment with the above described structure has several disadvantages. First, since a finished tire is removed from one of the molds and/or the inner tube is detached from the inside of said finished tire, it is necessary to use another cylinder and piston set.

The installment of separate sets of pistons and cylinders, which are used before and after the vulcanizing operation, significantly increases the weight of the equipment and the input required for the equipment. In addition, in many cases, the equipment must have a long length in the axial direction.

Furthermore, according to the above described conventional equipment, it is found that the concentricity of the inner tube, which is installed inside the tire material, tends to be imperfect. The asymmetrical stress, which is generated as the result of the imperfect concentricity of the inner tube, weakens

the finished tire, especially, the part of the tire, wherein air could otherwise reach the gap between the inner tube and the inside of the tire material.

Moreover, another disadvantage of the above described equipment is that, after the inner tube is removed from the vulcanized tire, the surface of the inner tube is thoroughly exposed to the surrounding air. As a result, the tube is excessively cooled between the continuous vulcanizing operations.

According to the present invention, the above described two-chamber type equipment, which is equipped with a vulcanizing press inner tube, can be constituted so as to eliminate all of the above described disadvantages. The ring-like sleeve surrounds the cylinder, which is installed in the center part inside the lower mold chamber. The sleeve is installed so as to reciprocally move in the axial direction between the lower direction or the position, wherein said sleeve is pulled, and the position, wherein said sleeve is lifted or extended, while the movement of the sleeve is made independently from the movement of the piston. The upper end of the sleeve supports the lower surface of the inner tube. As a result, the entire assembly body, which is equipped with the inner tube, is held in the lower mold chamber.

The axial movement distance of the sleeve is selected so that, when the piston is in the lowest position of said movement

distance, the sleeve is extended in the upper direction so as to expand the inner tube around the inner circumference of the tire material. Therefore, when the tube is expanded and the press is closed, the tire material is ready for vulcanization. When the relative position of the piston and the sleeve is reversed after the vulcanization operation, the finished tire is released from the lower mold chamber and at the same time the inner tube is extracted from the vulcanized tire. As a result, the vulcanized tire is swiftly and easily removed from the press and a new tire material is inserted.

According to the above described equipment, the sleeve is normally pulled into the mold chamber and the degree of extension of the sleeve in the axial direction is limited to the length, which is needed for its synergetic operation with the piston.

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The sleeve pulls and extends the inner tube into/from the casing. It is necessary to use a piston and cylinder, which is not separated. In addition, with the limited movement of the sleeve, it is possible to effectively minimize the length of the press in the axial direction.

Furthermore, the accessories and pipes, which are necessary for operating and heating various elements of the press, are connected to the element, which is completely held in the lower

mold chamber. The above described accessories and pipes may be fixed components, which are permanently installed inside the lower mold chamber. As a result, it is possible to eliminate the problem of the piping structure, which is flexible and long.

Figure 1 shows lower chamber 1 of the two-chamber press, which is suitable for vulcanizing tire material 57 as described below. The lower chamber contains lower mold 10, which is fixed onto horizontal member 12. The inner rim of horizontal member 12 is connected to long support pipe 17. Lower chamber 1 is connected to bottom flange 43 by support post 44.

Cylinder 34, which has perforated cover 29, is fixedly installed inside chamber 1. The outer rim of cover 29 is connected to bottom flange 43 through member 27.

Piston 38, which is supported by rod 33, downwardly passes through the center hole of cover 29 extending in the direction of the inside of cylinder 34. The upper end of the piston supports contact member 31 and the position of said member on rod 33 may be adjustable (by a means, which is not shown in the figure) so that it is adjusted to the height of tire material 57, which is different from the height of said member. In Figure 1, piston 38 is in the lowest position.

Member 31 covers a surface of vulcanizing inner tube 25, which can be expanded, and said tube can be inserted into tire material 57 according to the conventional usage of the

vulcanizing operation. According to the present invention, cylindrical sleeve 22 is installed so that it can slide and reciprocally move in the axial direction within lower chamber 1 between the upper position, which is shown in Figure 1, and the lower position, wherein the sleeve is completely pulled into the lower chamber. Upper rim 24 of sleeve 22, which is extended, holds the opposite surface of inner tube 25. The outer circumferential line of rim 24 has a shoulder part, which supports the lower end of tire material 57.

As shown in Figure 1, when piston 38 is in the lowest position and sleeve 22, which can independently move, is in the highest position, inner tube 25 is completely pulled into sleeve 22. Therefore, the tube is effectively separated by the surrounding air.

When tire material 57, which is to be vulcanized, is placed on the circumference of rim 24, piston 38 brings air through the hole in the lower end of cylinder 34 by using an appropriate means (not shown in the figure). As a result, the piston is lifted to the upper position as shown in Figure 2. Since sleeve 22 is in a position higher than the position of the piston, the above described movement of the piston symmetrically inserts the tube into the tire material. Since piston 38 and sleeve 22 are concentric with each other, the tube is held in the center position of the tire material.

Now, the piston is in the upper position while sleeve 22 is pulled into the position lower than the piston as shown in Figure 3 (for example, by feeding air between member 27 and the upper end of sleeve 22). At the same time, the pressurized air is fed to the inside of inner tube 25 (for example, through the second hole of cover 29 of cylinder 34) so as to expand the tube. While piston 38 remains in the upper position, the tube is expanded and sleeve 22 moves in the lower direction. As a result, the tube is rolled up along the inner surface of the tire material and attached to said inner surface.

As a result, upper chamber 3 of the press moves towards lower chamber 1 in the lower axial direction as shown in Figure 4. Chamber 3 contains upper mold 7, which can perform a synergetic operation with lower chamber 10. Furthermore, chamber 3 contains support ring 9. Said ring is positioned so as to come into contact with member 31, which is fixed to piston rod 33. Upper mold 7 and support ring 9 are attached to the wall of chamber 3 by web 6.

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In Figure 5, chamber 3 is in the position low enough to bring support ring 9 into contact with the upper surface of member 31 thereby pressing piston 33 downwards into cylinder 34. With the above described movement of the piston and the upper chamber, tire material 57 is tightened by the expanded inner

tube until the two chambers are engaged as shown in Figure 6. As a result, piston 38 and sleeve 22 are in the lower positions respectively.

Then, the inside of tube 25 is heated by an appropriate means, which is not shown in the figure, thereby vulcanizing tire material 57, which is molded into the final shape. While the two molds of the press are closed, the tightening device, which is expressed by flange encircling body 4, may be used on the rim of chambers 1 and 3.

When the vulcanizing operation is completed, flange encircling body 4 is removed and the upper chamber is separated from the lower chamber. To separate the finished tire from the mold, sleeve 22 is moved in the upper direction from the pulled-in position as shown in Figure 7 while piston 38 remains in the lower position. The finished tire is expressed by reference number 52 in the figure.

With the above described movement of the sleeve, it is possible to separate tube 25 from the inside of tire 52 so that the tube is completely pulled down from the tire when the sleeve reaches the uppermost position as shown in Figure 8. As a result, tire 52 is easily lifted up from the outer circumference of rim 24 and a new tire material is inserted for the subsequent vulcanizing operation.

Figure 9 is a diagram illustrating the detail of rim 24 and contact member 31, detail of heat and air introduction to tube 25, and detail of sleeve 22 and piston 38. Figure 9 corresponds to Figure 6, which shows one of the operational procedures.

The lower surface (Figure 9) of inner tube 5 is held between circumferential part 24A of rim 24 and main part 24B of said rim. The outer edge of main part 24B presses the inner surface of lower mold 10 when the press is closed.

Member 31 contains main part 31A, which has hanging wide flange 31B. Member 31 further contains inner ring 31C. The upper surface of tube 25 is held by lower flange 31B and ring 31C. Nut 35 is used for fixing main part 31A to piston rod 33 in a selected position along the piston rod.

Cover 29 of cylinder 34 encompasses center hole 29A and additional holes 30. Additional holes 30 are positioned separately in the radial direction of hole 29A. Holes 30 are connected to the inside of tube 25 in the outer edges of the cover. In addition, the holes are respectively connected to the pressurized air source and the heat source, which are expressed by some of fixed pipes 53, in the inner edges. As shown in the figures, the function of each of the other fixed pipes 53 are as follows: (a) connecting to the inside of cylinder 34 so as to move piston 38 in the upper direction within the cylinder; (b) guiding the pressurized air to the lower shoulder part 22A of

sleeve 22 so as to move sleeve 22 in the upper direction; and (c) guiding the pressurized air to upper rim 24 of sleeve 22 so as to move sleeve 22 in the lower direction.

According to the embodiment of Figure 9, sleeve 22 is installed so that it can slide in the inside of guide pipe 17. Pipe 17 and member 27 are separately fixed to lower chamber 1. As shown in Figure 10, guide pipe 17 may be equipped with lower flange 56. Said lower flange is directly fixed to lower flange 61 of member 27 by screw 55. In this case, sleeve 22 operates as a piston within the ring-like chamber, which is sandwiched between pipe 17 and member 27.

Except for the above described aspect, all of the aspects of the equipment of Figure 9 and that of Figure 10 are structurally and functionally equal.

The present invention is described above based on the preferred embodiment. However, many alterations and adjustments may be made by those skilled in the art. For example, piston 38 and cylinder 34 can move independently from sleeve 22 in the axial direction and may be replaced by another reciprocating device, which can achieve the above described function. In conclusion, the claims of the present invention are not limited to the specific disclosure of the present invention.

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4. Brief Description of the Drawings

Figures 1 to 8 are vertical cross-sectional views illustrating the two-chamber vulcanizing press, which achieves the continuous vulcanizing process of the tire material. The above described press uses the inner tube installment equipment according to the present invention (Here, some details of the press are omitted so as to clarify the present invention).

Figures 9 (a) and (b) are the detailed front views of the two-chamber vulcanizing press of Figures 1 to 8, which is in the closed position

Figure 10 is a vertical cross-sectional view illustrating another embodiment (handwritten).

57: tire material; 10: lower mold; 1: lower mold chamber; 7: upper mold; 3: upper mold chamber; 33 and 38: operational element (piston and its rod); 25: inner tube; 22: ring-like sleeve; 34: cylinder; 38: piston; 29: cylinder cover; 29A: first center hole; 30: second hole.

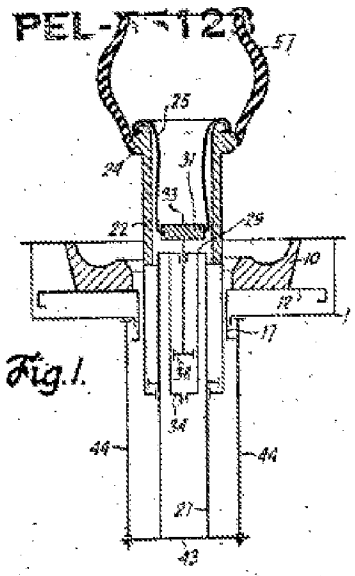


Fig.1.

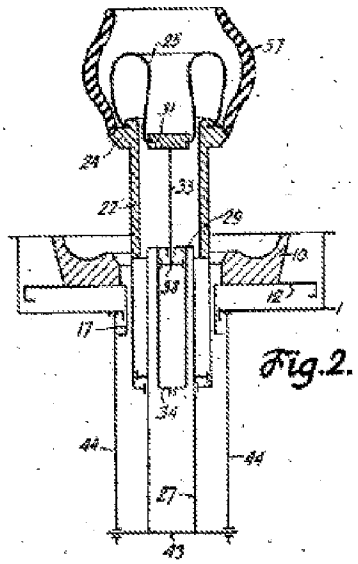


Fig.2.

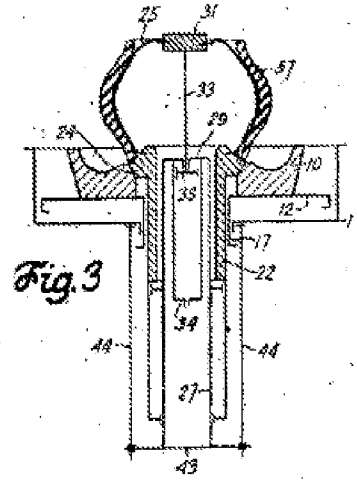


Fig.3

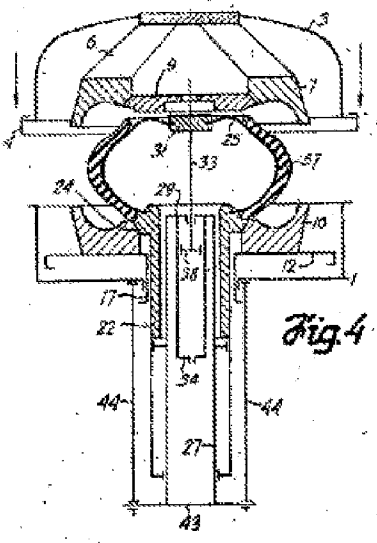


Fig.4

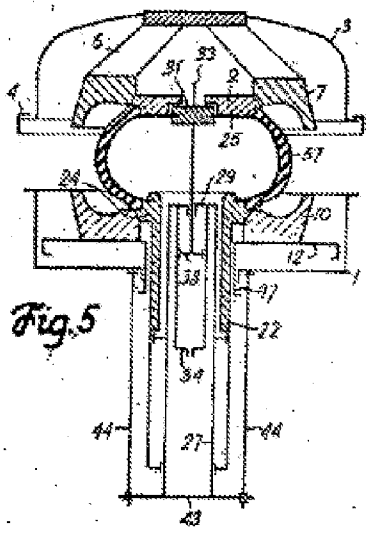


Fig.5

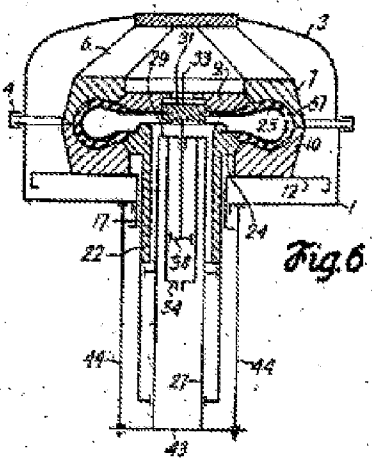


Fig.6

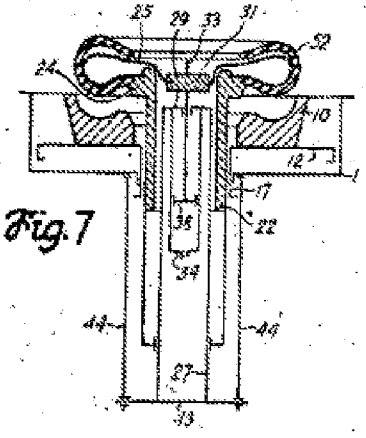


Fig.7

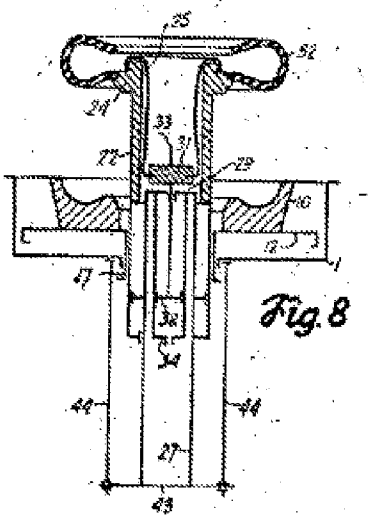
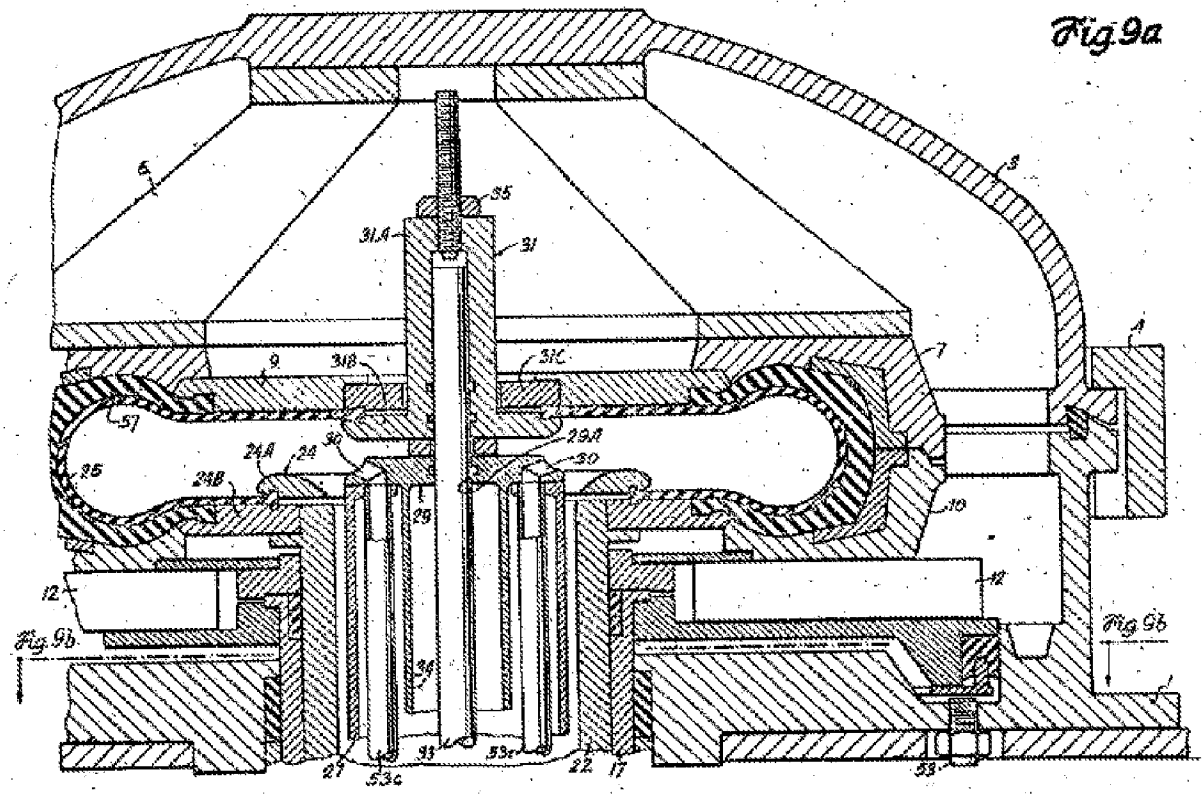


Fig.8

Fig.9a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31A
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31B
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Fig.9b
Fig.9b
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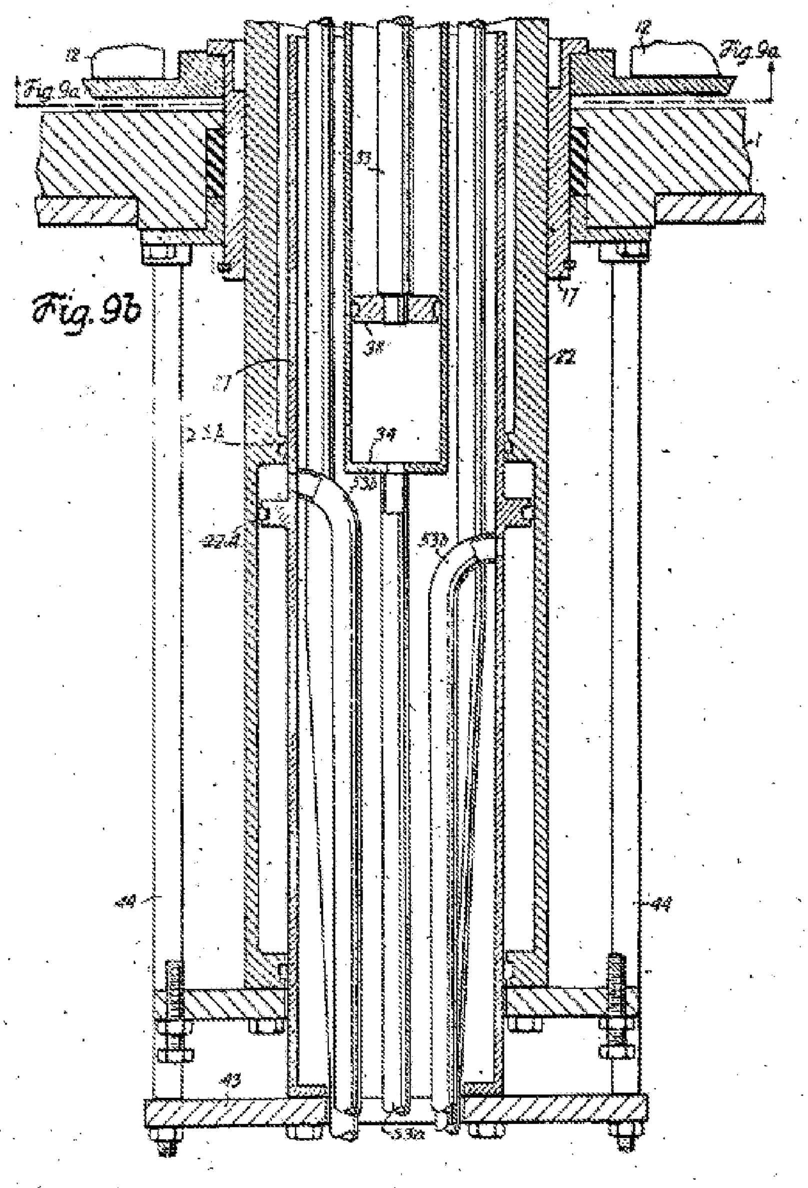
Fig. 9b
Fig. 9a
Fig. 9a
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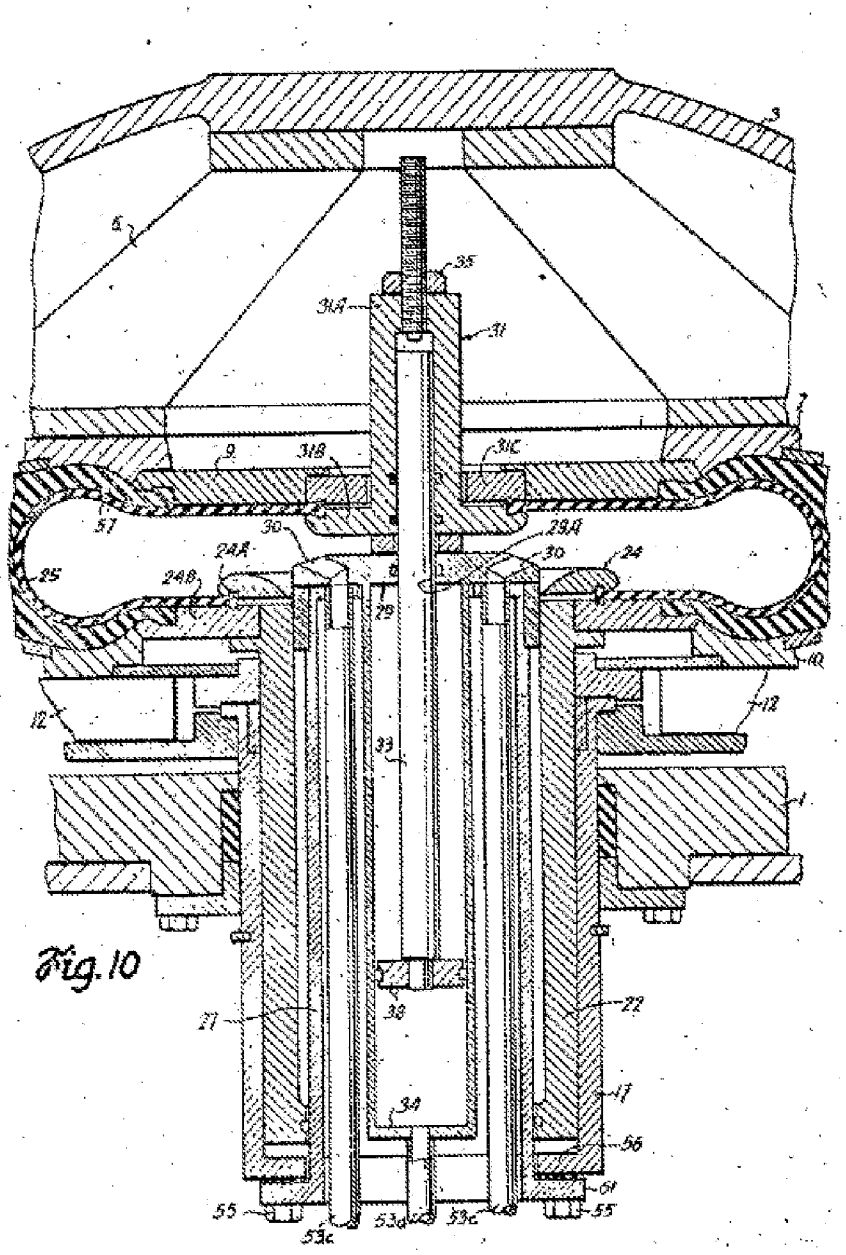

Fig. 10

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Amendment (format)

October 19, 1972

To: Commissioner of Patents

1. Case

Patent application No. Sho 47-61767

2. Title of the Invention

TIRE MATERIAL VULCANIZING PRESS

3. Party to make the present amendment

Relationship with the case: Patent Applicant

Address and Name: CHODOSU, NARODONI, BODONIKU (CZECHOSLOVAKIA)

4. Agent

Address: Shin-ohtemachi Bldg., 331, 2-2-1 Ohtemachi, Chiyoda-ku, Tokyo. Tel: (211) 3651 (main)

Name: (3114) ASAMURA, Naruhisa

5. Date of Amendment Directive

September 26, 1972

6. Number of inventions (claims) to be increased due to the present amendment: N/A

7. Subject of the amendment

Drawings (1 copy)

8: Content of the amendment

See the attachment.

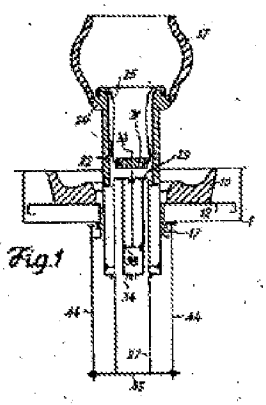

Fig.1

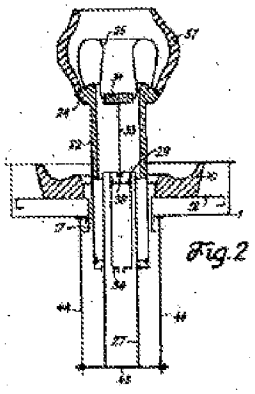

Fig.2

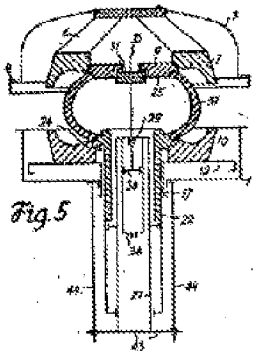

Fig.5

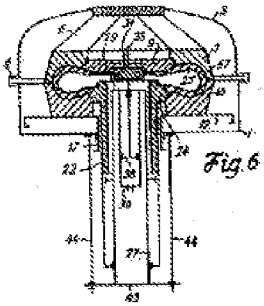

Fig.6

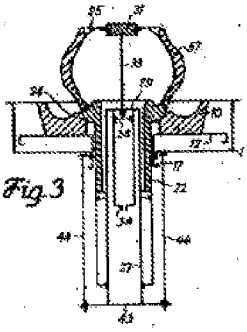

Fig.3

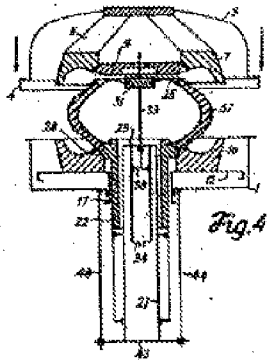

Fig.4

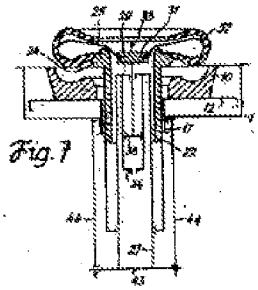

Fig.7

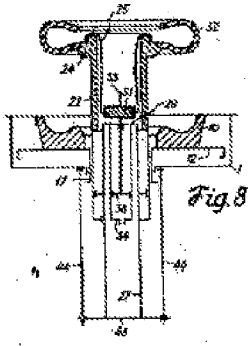

Fig.8

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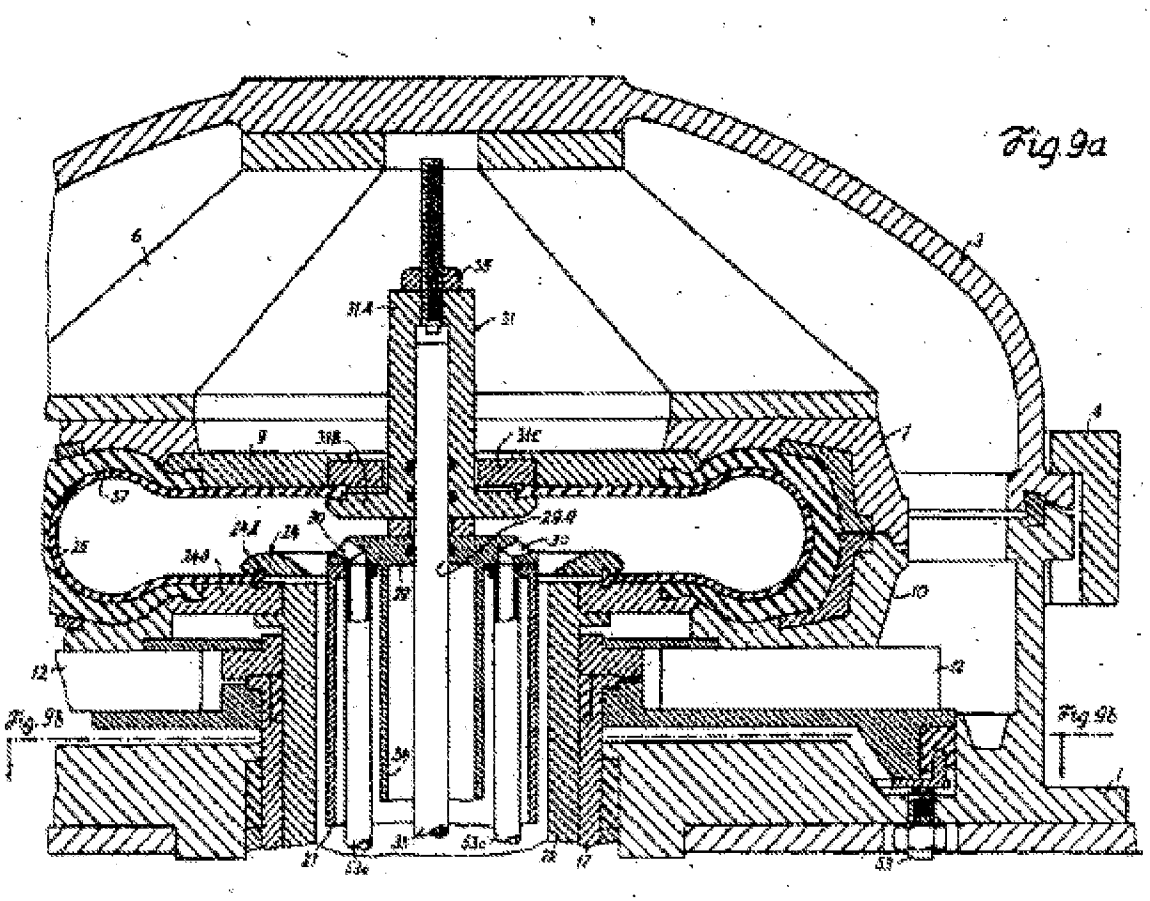
Fig 9a
Fig 9b
Fig 9b

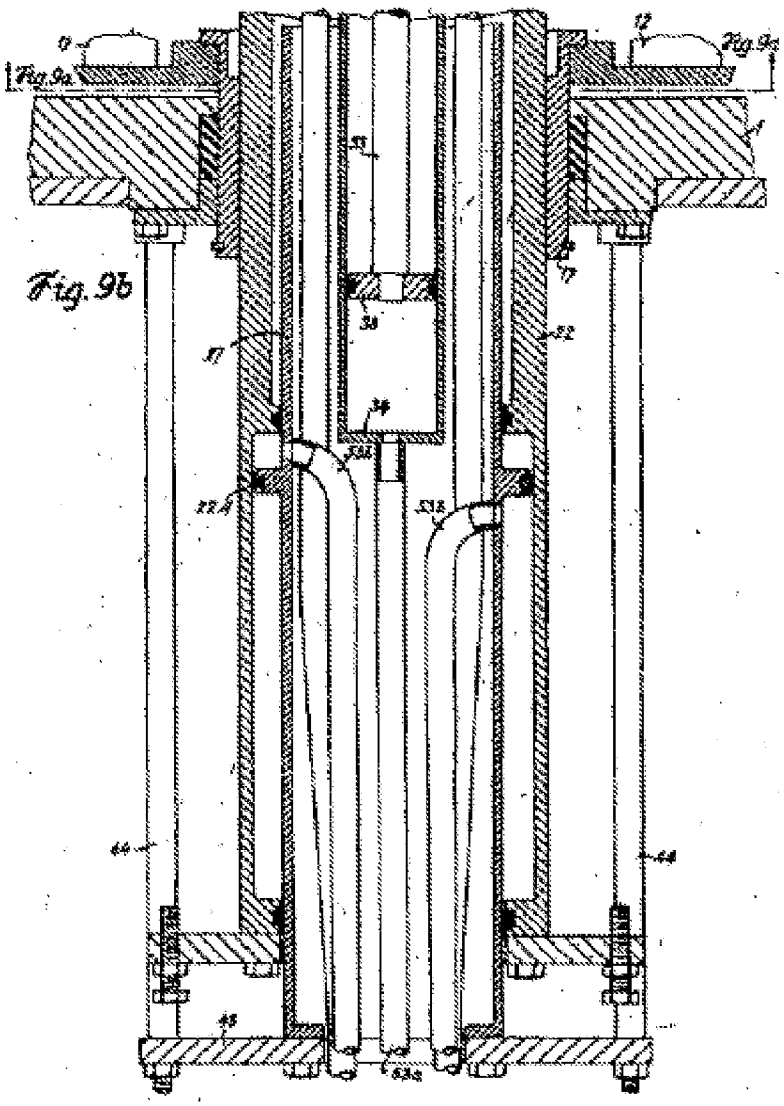

Fig. 9b

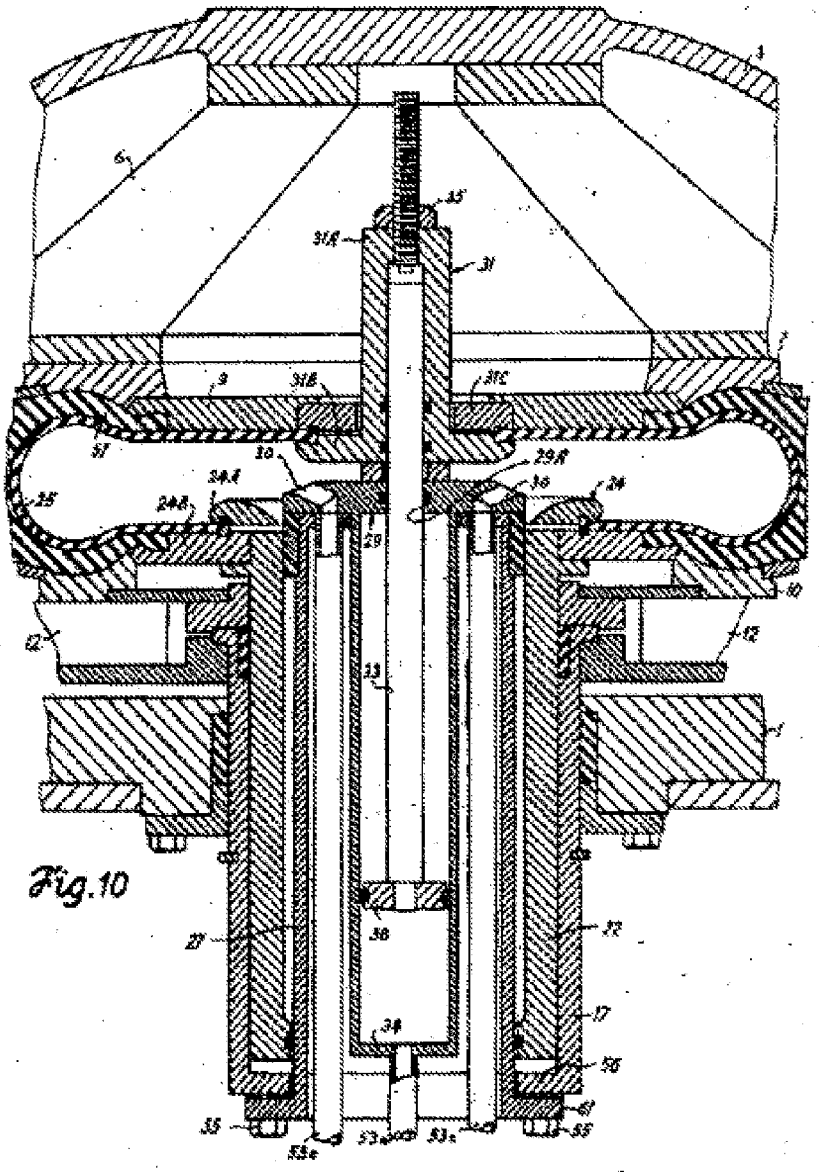

Fig.10